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75. (New) The thermoacoustic device according to claim 74, wherein the first and second oscillating members are integrally formed.

76. (New) The thermoacoustic device according to claim 61, wherein the housing comprises a pressure vessel, the main chamber and multiplier chamber being disposed in the pressure vessel, an additional volume of gaseous working fluid filling the pressure vessel.

77. (New) The thermoacoustic device according to claim 61, further comprising a thermal storage element disposed between the first and second heat exchangers.

78. (New) The thermoacoustic device according to claim 61, wherein;

the first heat exchanger comprises a plurality of generally parallel heat transfer elements disposed generally in a first plane and generally aligned in a first direction;

the second heat exchanger comprises a second plurality of generally parallel heat transfer element disposed in a second plane and generally aligned in a second direction, the second plane being generally parallel to the first plane and the second direction being at an angle to the first direction.

79. (New) The thermoacoustic device according to claim 78, wherein the heat transfer elements of the first heat exchanger are fins and the heat transfer elements of the second heat exchanger are fluid filled tubes.

80. (New) The thermoacoustic device according to claim 78, wherein the first and second directions are generally perpendicular.

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CLAIM AMENDMENTS

1-60. (Cancelled)

61. (New) A thermoacoustic device having an operating mode and a non-operating mode, the device comprising:

a housing;

a thermal core supported in the housing and having a first and a second surface, the thermal core including a first heat exchanger defining the first surface of the thermal core and a second heat exchanger defining the second surface of the thermal core;

a main chamber in fluid communication with the first surface of the thermal core;

a secondary multiplier chamber in fluid communication with the second surface of the thermal core;

a working volume of a gaseous working fluid filling the main chamber, the multiplier chamber, and the thermal core at a pressure, an equilibrium pressure being defined as the pressure of the working volume of gaseous working fluid when the thermoacoustic device is in the non-operating mode;

the main chamber including a first oscillating member, the first oscillating member being operable when the thermoacoustic device is in the operating mode to oscillate such that pressure in the main chamber is oscillated between a peak pressure greater than the equilibrium pressure and a minimum pressure less than the equilibrium pressure, a main pressure amplitude being defined as one half of the difference between the peak pressure and the minimum pressure in the main chamber;

the secondary multiplier chamber including a second oscillating member, the second oscillating member being operable when the thermoacoustic device is in the operating mode to oscillate such that the pressure in the multiplier chamber is oscillated between a peak pressure greater than the equilibrium pressure and a minimum pressure less than the equilibrium pressure, a multiplier pressure amplitude being defined as one half of the difference between the peak pressure and the minimum pressure in the multiplier chamber;

wherein the first and second oscillating members oscillate at substantially the same frequency and generally in phase; and

the multiplier pressure amplitude is greater than the main pressure amplitude.

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62. (New) The thermoacoustic device according to claim 61, wherein the multiplier pressure amplitude is at least 2% greater than the main pressure amplitude.

63. (New) The thermoacoustic device according to claim 61, wherein the multiplier pressure amplitude is at least 4% greater than the main pressure amplitude.

64. (New) The thermoacoustic device according to claim 61, wherein the multiplier pressure amplitude is at least 6% greater than the main pressure amplitude.

65. (New) The thermoacoustic device according to claim 61, further comprising a motor connected to the first oscillating member, the motor being operable to sinusoidally oscillate the first oscillating member such that the thermoacoustic device operates as a heat pump.

66. (New) The thermoacoustic device according to claim 61, further comprising an alternator connected to the first oscillating member, the thermoacoustic device operating as a heat driven engine.

67. (New) The thermoacoustic device according to claim 61, wherein the multiplier chamber is disposed within the main chamber.

68. (New) The thermoacoustic device according to claim 67, wherein:

the first heat exchanger comprises a hot heat exchanger;

the second heat exchanger comprises cold head heat exchanger which forms one end of the housing, the cold head heat exchanger having an exterior heat exchange surface in thermal communication with an interior heat exchange surface;

the thermoacoustic device further comprising;

a support disposed in the housing adjacent the interior heat exchange surface of the cold head heat exchanger, the support defining a first passage between the multiplier volume and the interior heat exchange surface of the cold head heat exchanger and a second passage between the main volume and the interior heat exchange surface of the cold head heat exchanger, whereby the main volume and the multiplier volume are in fluid communication through the first and second passages;

a porous thermal storage element disposed in the first passage, the thermal storage element having a first surface and a second surface, the first surface being adjacent the interior heat exchange surface of the cold head heat exchanger and the hot heat exchanger being disposed adjacent the second surface of the thermal storage element.

69. (New) The thermoacoustic device according to claim 61, wherein the first oscillating member comprises a piston, the main chamber including a flexure seal having a pair of ends and a flexure body extending therebetween, one end of the flexure seal being sealed to the piston and the other end being sealed to the first surface of the thermal core.

70. (New) The thermoacoustic device according to claim 69, wherein the flexure seal comprises a bellows.

71. (New) The thermoacoustic device according to claim 61, wherein the main chamber has a perimeter side wall and the oscillating member comprises a piston with a perimeter edge that slidably engages the side wall.

72. (New) The thermoacoustic device according to claim 61, wherein the multiplier chamber has a perimeter side wall with a edge spaced from the second surface of the thermal core, the second oscillating member comprising a piston interconnected with the edge by a flexible seal.

73. (New) The thermoacoustic device according to claim 61, wherein the second oscillating member comprises a piston, the multiplier chamber including a flexure seal having a pair of ends and a flexure body extending therebetween, one end of the flexure seal being sealed to the piston and the other end being sealed to the second surface of the thermal core.

74. (New) The thermoacoustic device according to claim 61, wherein the first and second oscillating members are interconnected such that their displacements are identical.